

Networking a Need: A Cost-Effective Approach to Statewide Health Information Delivery

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VTMEDNET is the health information network for the state of Vermont. In response to a needs assessment of rural health care providers, it supports e-mail, access to knowledge-bases, and the ability to request library services for health care providers across the state, regardless of their location or affiliation. For Fletcher Allen Health Care affiliates, it also supports access to in-patient hospital records. Two thirds of the state's physicians are using the network as well as many other health care providers, and, with minimal cost, it has begun to meet its goal of improving health care delivery to many of Vermont's citizens.

BACKGROUND

Vermont, according to several federal definitions, is the most rural state in the nation. The 1990 census indicated that 68% of its population lives in towns and villages of 2,500 people or less. The state is also small geographically, with 9,249 square miles, which accommodates its population of approximately 550,000. Travel, considering its size and population spread, would be extremely manageable in many parts of the United States. However, with the Green Mountains running through the center of the state from its Massachusetts to Canadian borders and the dearth of mountain passes, which are often closed during the five winter months, rural isolation is the norm.

With respect to health care, approximately 85% of Vermont's counties have towns designated as Medical Underserved Areas and ten locales have received the unwanted distinction of being classified as Health Professional Shortage Areas. There are approximately 900 practicing Vermont physicians, fifteen hospitals in the state, most under 100 beds, and only one tertiary care medical center, Fletcher Allen Health Care, which is affiliated with the University of Vermont College of Medicine.

Although access to health care services is sometimes a problem, the commitment of the state's health care providers to insuring a high quality of health care for all of its citizens at a reasonable cost is not. Vermont's Governor is a practicing physician. Vermont's Health Care Reform legislation was one of the first in the nation and created the state's Health Care Authority to promote quality while managing costs. Vermont's Dr.

Dinosaur program proactively seeks to insure that all of Vermont's children have a broad spectrum of health services, and is one of many examples of statewide programs designed to improve the health status of Vermonters.

Vermont's health care community is, in many ways, like a large metropolitan medical center, with a central hospital, several specialty clinics and feeder hospitals, and remote practice sites. Although most of the hospitals and individual practices are independent, the permeating spirit has been one of co-optition, heavy on cooperation with a friendly competition leading to improved quality. This, along with Vermont's grassroots mentality, set the stage for the creation of VTMEDNET, a health care information network which reaches into the offices and homes of the majority of health care providers in Vermont.

IDENTIFYING A NEED

Timely access to needed information is essential in any health care delivery system. The information can range from the computerized patient record to aggregate management data to knowledge-based information. The health care delivery system can be a solo practitioner office or an academic medical center or a managed care enterprise. However, in today's health care environment driven by the cost/quality equation, the need for information on demand is very real.

Vermont was a likely candidate for a state-wide health information network. Vermont's health care community is relatively small, yet access to other health professionals and collegial as well as patient care information had been limited by proximity to the state's hospitals and academic medical center. The University of Vermont and the College of Medicine had new administrations which were embracing a policy of outreach to the state and the Health Care Authority was establishing criteria for aggregate data exchange in support of health care delivery systems. Both saw the creation of a state-wide network as a vehicle to reach their respective goals.

Recognizing a need is a first step towards a workable solution. However, a viable solution also requires an understanding of the environment and a buy-in by those who have the need. For a state-wide

health information network to work in Vermont, the end users needed to be part of the process from the beginning, and if the network was going to be used, it had to be both usable and useful. Therefore, two groups of health care providers were approached for input.

A targeted group of physicians was interviewed across Vermont to determine their health information needs and their criteria for using a network, should one be established. The interviews proved useful in two ways. While most physicians stated that they wanted immediate access to their patient records, problem lists, and alerts, few were willing to invest the money necessary to implement and support such a system. In fact, while many had seen prototypes of powerful systems at medical meetings and were basing their responses on what they had seen and thought was possible, those same respondents also indicated that by far their top priority would be the ability to communicate with other physicians electronically. They would also prefer to use a menu rather than a mouse.

Responses to a survey instrument given to a group of rural nurse practitioners indicated similar feelings about what they would find useful. Of all the potential applications, e-mail was the most requested item. On-going maintenance was found to be the biggest concern, both in terms of cost of equipment and access to help. Yet both groups indicated that they wanted and would use a state-wide network if it were available.

PRELIMINARY PLAN: \$\$\$\$

The need for the network was identified and planning begun late in 1992. In the Spring of 1993, an RFP for a High Performance Computing and Communications contract was issued. In response to the initiative, the conceptual planning phase accelerated and, through a partnership with both NYNEX and BBN/NEARNET as an Internet provider, a several million dollar plan for a state-wide network, VTMEDNET, was committed to paper.

The network architecture was relatively simple, relying on leased lines connecting the state's sixteen hospitals, with each of the hospitals supporting modem banks of varying sizes to provide toll-free modem access to the network from the practice sites. NYNEX had had an aggressive campaign of laying fiber optic cable across the state for the past five years, and the hospitals agreed to maintain the modem banks and support their affiliated practitioners. The academic medical center agreed to manage the network applications and facilitate the on-going research activities developed to evaluate the network and its use as well as research activities which used the network for data exchange.

The HPCC proposal was technically sound, had the buy-in of virtually the entire health care community,

from the Governor to the most isolated rural family practitioner, and although in the group of finalists for an award, it was not funded. The request was for over four million dollars, well beyond the academic medical center or even the state's ability to fund. However, it's hard to kill a good idea in a grassroots state.

CURRENT TECHNOLOGY: LOW COST, HIGH SAVINGS

Nationally, a number of wide area networks had already been built and offered concepts which were considered for integration. Some supported delivery of library and information resources.¹⁻² Some delivered patient care information.³⁻⁴ Some were designed to collect and distribute aggregate health information.⁵⁻⁶ VTMEDNET, as the state's only health information network, needed to include all facets of health information.

Usability was one of the most frequently requested features in the first two needs assessments. While usability in the academic medical center was immediately envisioned as a sophisticated windows based system employing a graphical user interface, the concept of usability for isolated, rural, primary care practitioners meant the ability to use an extant computer, possibly even an old XT, and the comforting knowledge that he or she would not have to learn to use windows.

Access needed to be affordable, but all potential users indicated that they were willing to pay something, especially if the cost was based on use. Most did not need to send or receive large amounts of data. In fact, e-mail communication was the most desired application. If VTMEDNET was to become the state's health information network, it needed to meet the requirements of the lowest of the low end user. To do this, a hybrid network architecture was employed, which would provide the maximum connectivity, regardless of platform.

The initial approach utilized a LAN, extant leased lines with Ethernet connections for those practices affiliated with the UVM College of Medicine and Fletcher Allen Health Care (including the tertiary inpatient and outpatient campuses), and a Public Switched Packet Data Network (Infopath) to provide dial-access capabilities to all health care providers within Vermont. Two leased lines were subsequently installed to connect two of the state's larger hospitals with the academic medical center. The network server is a Unix platform running TCP/IP which enables access by PC's, MAC's and Unix workstations and provides connections to the hospital mainframe and several Novell networks. The network configuration has been designed both to meet immediate needs as well as provide a foundation for rapid expansion into the next generation of networking architecture.⁷

VTMEDNET was initially conceptualized by the UVM College of Medicine and the network design was accomplished through a partnership with NYNEX, in part to provide remote access to patient records for those providers affiliated with Fletcher Allen Health Care. However, when the focus expanded to offer more information resources to health care professionals across the state, the project received joint sponsorship from the College, the Vermont Hospital Association (VHA) and the Vermont State Medical Society (VSMS) with political support from the Vermont Health Care Authority and Dr. Howard Dean, Vermont's physician Governor.

The partnerships were important for two reasons. The College of Medicine and Fletcher Allen Health Care had an obligation to support the health care providers of the state, but they did not have unlimited resources. They made a commitment to support the Internet Node, VTMEDNET.ORG, and provide the Unix server which houses many of the applications and all of the state's health care community e-mail accounts. However, they did not have the staff to provide requisite access assistance in trying to get novice computer users onto the network.

The Vermont State Medical Society (VSMS) agreed to handle all user applications and maintain a database of physician subscribers. They have been responsible for all mailings and support many of the educational activities offered about and through the network. The Vermont Hospital Association (VHA) provides coordination for end-user support. A triage system has been implemented whereby users seek technical assistance first from the information services departments in their respective hospitals, then from the Manager of Information Services at the Vermont Hospital Association, and lastly from the Information Services Division at Fletcher Allen Health Care.

The academic medical center also felt that it did not have the resources to maintain the kind of modem bank and billing system that would be required if VTMEDNET was heavily used. Therefore, in working with NYNEX, VTMEDNET users are able to connect to the NYNEX Vermont modem bank through the Public Switched Packet Data Network and have the connect time billed back to their local phone at a rate of approximately four to six cents per minute.

Strategic partnerships have enabled VTMEDNET to become a reality, not for the four plus million dollars of the HPCC proposal, but for less than one hundred thousand. With a few minor exceptions, every initial proposed application is available. However, in addition to providing needed human resources, the partnerships provided an endorsement that went far beyond letters of support. The VHA, the VSMS, and the State Government have recognized VTMEDNET as the state's single health information network. Their

participation, and the information they supply to the network, have created a demand for membership considerably greater than initial expectations.

CREATING A DEMAND

The results of the preliminary needs assessment indicated that the two major features desired in a state-wide network were the ability to use extant hardware and the ability to communicate electronically with colleagues. The desirability of both features, predicated on the concepts of usability and usefulness, was not surprising. Vermont is a relatively poor state, and many rural primary care providers have only the most rudimentary of computer hardware and software. Thus, the ability to upgrade equipment is critical to use.

The desirability of the second feature, e-mail access, is less obvious. Living in rural Vermont is a choice made by many, cognizant of hardships. The one factor which has had a significant negative impact on the ability to retain rural primary care providers is the feeling of isolation. Many practitioners interviewed felt that VTMEDNET, through use of e-mail, would serve as an electronic umbilical cord back to the academic medical center; and this would mitigate their sense of professional detachment. Both features provided the framework for developing VTMEDNET.

However, as the state's health information network, VTMEDNET could not be built solely as an e-mail system accessible by multiple platforms. A survey instrument was designed and mailed to all 817 members of the Vermont State Medical Society, which includes approximately ninety percent of all licensed Vermont physicians. The physicians were asked to indicate the usefulness of a number of knowledge-based information resources, electronic utilities, and features relating to the usability of the network.

Two hundred seventy-nine usable responses (34% of survey recipients) were received to make the findings statistically significant. For purposes of planning for the features and functions of VTMEDNET, a simple percentage was calculated. Responders were asked to rank the options in one of four categories: Essential, Important, Unimportant, No Opinion.

In Category 1, Usability, ease of logging onto VTMEDNET was considered essential by over half of the respondents, and when paired with the important rank, over 90% felt this feature was paramount to functionality of the system. While it would be virtually impossible to support all of the communications software packages in use in Vermont, a decision was made to offer full support for all versions of PROCOMM and a script was written and distributed to PROCOMM users to facilitate logging into VTMEDNET through Infopath.

Over 90% of all respondents wanted

VTMEDNET to be menu-driven. Less than 10% felt that a graphical user interface was essential and only an additional 34% felt that it would be important. These findings supported the previous needs assessment and the knowledge that the ability to use existing equipment was more important than "bells and whistles." Also, on-line help was favored over telephone assistance.

In Category 2, Utilities, e-mail was ranked as essential or important by over 75% of respondents. However, some of the returned questionnaires also indicated that the respondents had e-mail accounts with commercial vendors. The top ranked utility was the ability to electronically request library services from the academic medical center library. This finding can readily be explained by the fact that only a few of the hospitals in Vermont still have a full-time librarian, so access to library services is extremely limited. Over 85% felt that this feature was essential or at least important.

Over 75% ranked Internet access as important or essential, and approximately the same number wanted access to medical bulletin boards. However, one of the most surprising findings was that over 70% of the respondents indicated that they would like to request medical consultations electronically. Generic, non-reimbursed, consults are not uncommon in Vermont. The UVM College of Medicine instituted a Provider Access Service two years ago which enabled almost immediate access by telephone to specialists at the academic medical center. Comments received indicated that while referring physicians might be reticent to call a specialist for something not deemed an emergency, an electronic request for a consult offered a viable option.

In Category 3, Information Resources, online drug information was the feature of choice, followed by online access to practice guidelines and consensus statements. The ability to browse medical library catalogs was a highly rated feature, with over 75% of respondents ranking the feature as essential or important. Of lesser importance was the ability to access cancer information, the FDA Bulletin Board, or NIH grant information. However, due to the specialty nature of the databases, the responses were anticipated.

Not anticipated, however, was the lack of enthusiasm for providing online access to the Vermont Immunization Registry. For VTMEDNET to fully function as a health information network, it needs to offer features uniquely useful to the Vermont health care community. Working in collaboration with the Vermont Health Department, VTMEDNET hopes to offer network access to the registry in the near future. However, only 35% of the respondents indicated that access was either essential or important. One possible explanation could be found in the small number of pediatricians who returned the surveys.

The survey results provided a framework for

VTMEDNET, but they also provided an interesting window on the information needs of rural health care providers. VTMEDNET does not embody the forefront of technological innovation. Its value lies in its inherent practicality. VTMEDNET is a tool to improve health care delivery in the most rural of environments. It is a tool to improve communication among health care providers and to enhance the ability of isolated professionals to access knowledge-based information resources in support of health care delivery.

In addition to e-mail and Internet access, VTMEDNET provides a direct electronic link to the Dana Medical Library. Through a template, subscribers are able to ask questions, request information searches, and receive articles electronically from Vermont's only Resource Library in the National Network of Libraries of Medicine. VTMEDNET also enables subscribers to browse the major medical library catalogs of the world, including the National Library of Medicine in Washington, D.C.

VTMEDNET provides access to several data and knowledge-bases which users can search themselves. These resources include Practice Guidelines and Consensus Statements (HSTAT) from the Agency for Health Care Policy and Research, Cancer Information and Protocols (PDQ) from the National Cancer Institute, the FDA Bulletin Board, and formulary drug information.

One of the most requested features is the VTMEDNET Bulletin Board available on a public-access gopher. For example, the Health Care Authority, charged with drafting Vermont's health care reform legislation, posts announcements about public hearings, news releases, draft proposals, etc. on the Bulletin Board. This process saves time and reaches more interested parties than the usual forms of communication. Similar Bulletin Boards exist for the Vermont Hospital Association and the Vermont State Medical Society.

In addition to the Bulletin Board gopher, VTMEDNET supports a Health Gopher which also enables unlimited access to the Internet through Veronica pointers. Again, because the level of sophistication of the majority of the users is quite low, the menu-driven system has been designed to provide the maximum utility with the minimum of hardware and technical expertise requirements.

IMPROVING HEALTH CARE DELIVERY

VTMEDNET was designed to serve as a "virtual colleague," encouraging communication among all of Vermont's health care providers regardless of the physical distance or even the depth of snow drifts. Through its e-mail and gopher functions, it has more than succeeded, and many who have related their fear of computers have begun to enjoy its features. Rural

primary care providers have indicated that VTMEDNET lessens their feelings of isolation and brings the benefits of the academic medical center closer to those who practice in medically underserved areas.

However, the greatest value-added has been the actual improvement in health care delivery, particularly among rural primary care providers. The National Information Infrastructure offers a miraculous global vision. Nevertheless, the practicality within the health care community must be based on the single patient and the ability to improve health care outcomes. In this respect, VTMEDNET has surpassed expectations.

While the network has not been in operation long enough to accurately assess its cost/benefit, two anecdotes uniquely demonstrate the power and practicality of the system. In late November, 1994, a primary care physician, on his way to his office, hurriedly reviewed the chart of a hospitalized status asthmaticus patient prior to discharge the following morning. Later that evening, from his home, the family practitioner logged onto VTMEDNET and after reading his e-mail, he leisurely perused the hospital records of his patients. The lab report on the asthmatic about to be discharged indicated a 3+ glucose in her urine, suggesting that she was probably an undiagnosed diabetic. The condition could have gone undiagnosed for years and caused irreparable damage. Because the family practitioner used VTMEDNET, he was able to discover a serious, yet asymptomatic, patient problem and initiate appropriate management.

In January, 1995, a respected surgeon from Bennington, who was a relatively novice computer user, had begun to enjoy "Surfing the Internet" using VTMEDNET. One Friday afternoon, he saw a patient with breast cancer, and in discussing the treatment options with her, she asked whether a specific chemotherapy would have any impact on her later ability to have children. The surgeon didn't know, but later logged onto VTMEDNET and searched the patient files of the PDQ - Cancer Information database. When he saw the patient the following Monday, he had a printout with the answer to her question as well as patient educational materials about the specific chemotherapy treatment.

These are two examples of both the simplicity and the power of the network. Rather than a Ferrari, it has been referred to as a Jeep Wrangler on the Information Super Highway. It is not expensive and does not require high maintenance. It does not require a course in driver's education because the menus make most operations intuitive. It was designed to be both usable and useful, and it gives users what they wanted and not what the academic medical center thought they needed. Perhaps the greatest testimonial is that VTMEDNET, in its first year of operation, has been used by over two thirds of the licensed physicians in the state

of Vermont and continues to improve the quality of health care delivery across a very rural and medically underserved state.

FUTURE PERFECT

VTMEDNET is a beginning. As technology improves and information access, particularly in health care, becomes a function of human conditioning, VTMEDNET will be ready to offer informational resources in multiple formats. VTMEDNET is currently designed to support data communication. However, Vermont has a network infrastructure which could easily support interactive video in even the most rural and isolated parts of the state. While VTMEDNET was created through grassroots support and partnerships among the major health care players in Vermont, it has been recognized as a first step towards the next generation of health care networking, a form which will benefit the patient through telemedicine and multimedia applications while enhancing the value already demonstrated by providing a state-wide health information network.

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